

Wireless sensor networks to assess the impacts of global change in Sierra Nevada (Spain) mountains

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Sierra Nevada Global Change Observatory (southern Spain) aims to improve the ability of ecosystems to address the impacts of global change. To this end, a monitoring program has been implemented based on the collection of long time series on a multitude of biophysical variables. This initiative is part of the Long Term Ecological Research network and is connected to similar ones at national and international level. One of the specific objectives of this LTER site is to improve understanding of the relationships between abiotic factors and ecosystem functioning / structure. Wireless sensor networks are a key instrument for achieving this aim. This contribution describes the design and management of a sensor network that is intended to monitor several biophysical variables with high temporal and spatial resolution in *Quercus pyrenaica* forests located in this mountain region.

The following solution has been adopted in order to obtain the observational data (physical and biological variables). The biological variables will be monitored by PAR sensors (photosynthetically active radiation), and the physical variables will be acquired by a meteorological station and a sensor network composed of temperature and soil moisture sensors, as well as air temperature and humidity ones. To complete the monitoring of the biological variables, a NDVI (Normalized Difference Vegetation Index) camera will be deployed focusing to a *Quercus pyrenaica* forest from the opposite slope. It should be noted that all monitoring systems exposed will be powered by solar energy.

The management of the sensor network covers the deployment of more than 100 sensors, guaranteeing both remote accessibility and reliability of the data. The chosen solution is provided by the company Adevice whose ONE-GO communication system ensures a consistent and efficient sending of those values read by the different sensors towards a central point, from where the information (RAW data) is accessible through WiFi/3G. RAW data is dumped daily in our data center for further processing with the open source software Get-IT. Get-IT was developed by the CNR (National Research Council of Italy) in the context of the RITMARE Flagship Project and LifeWatch Italy in order to combine geographic information with observational data by coupling GeoNode with SOS implementation by 52° North. This solution conforms to our requirements for two reasons, the first is that it provides data persistence, metadata editing and data visualisation tools. The second is that it is the solution adopted by LTER, platform previously mentioned in which we are integrated. This research has been funded by eLTER (Integrated European Long-Term Ecosystem & Socio-Ecological Research Infrastructure) Horizon 2020 EU project, and Sierra Nevada Global Change Observatory (LTER-site).